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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/667,949	09/22/2003	David K. Umberger	10991300-3	1226

7590 10/12/2006

HEWLETT-PACKARD COMPANY
Intellectual Property Administration
P.O. Box 272400
Fort Collins, CO 80527-2400

EXAMINER
MASKULINSKI, MICHAEL C

ART UNIT	PAPER NUMBER
2113	

DATE MAILED: 10/12/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	10/667,949	UMBERGER ET AL.	
	Examiner	Art Unit	
	Michael C. Maskulinski	2113	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *22 September 2006*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-23* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-3,6-16 and 20-23* is/are rejected.

7)☒ Claim(s) *4 and 5* is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

Non-Final Office Action

Double Patenting

1. Claims 1, 3, 4, 11, 13, 15, 16, are rejected on the ground of nonstatutory obviousness-type double patenting as being unpatentable over claims 1, 3, 4, and 6 of U.S. Patent No. 6,647,514 B1. Although the conflicting claims are not identical, they are not patentably distinct from each other because of the following.

Claim Rejections - 35 USC § 102

2. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.
>
> (e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

3. Claims 1-3, 6-16, and 21-23 are rejected under 35 U.S.C. 102(e) as being anticipated by Tamai et al., U.S. Patent 6,799,283 B1.

Referring to claims 1 and 11, in column 4, lines 57-60, Tamai et al. disclose that when another failure occurs in another disk drive of the same parity group while the defective disk drive is left as it is, reconstruction cannot be executed. Therefore, reconstruction is required to be executed as early as possible (identifying that a storage array is close to permanently losing data). In column 13, lines 26-38, Tamai et al. disclose that the array controller generates a read or write request for data

reconstruction. The generated read or write request has predetermined priority. When the disk array device provides relatively high priority, the read or write request is processed with priority, ensuring the end time of data reconstruction (giving, in response to identifying that the storage array is close to permanently losing data, input/output (I/O) requests for rebuilding at least a portion of the storage array priority over host I/O requests).

Referring to claims 2, 12, and 22 in column 4, lines 57-60, Tamai et al. disclose that when another failure occurs in another disk drive of the same parity group while the defective disk drive is left as it is, reconstruction cannot be executed. Therefore, reconstruction is required to be executed as early as possible (wherein the identifying comprises identifying that the storage array is close to permanently losing data when failure of one additional storage device of a plurality of storage devices in the storage array would result in permanent data loss in the storage array).

Referring to claims 3 and 16, in column 22, lines 29-37, Tamai et al. disclose that the storage array comprises a redundant array of independent disks (RAID) system.

Referring to claim 6, in column 13, lines 30-35, Tamai et al. disclose that when the disk array device which executes reconstruction processing provides relatively low priority for the read or write request for data reconstruction, the read or write request is processed without affecting other real-time processing (giving host I/O requests priority over rebuild I/O requests if the storage array is not close to permanently losing data).

Referring to claim 7, in column 13, lines 46-48, Tamai et al. disclose that the array controller enqueues the generated read or write request to the queue in the

corresponding recording medium according to the predetermined priority (placing both I/O requests for rebuilding at least the portion of the array and host I/O requests into a queue in the order they are received; and processing the I/O requests for rebuilding and the host I/O requests from the queue in a first-in-first-out (FIFO) manner).

Referring to claims 8 and 13, in column 13, lines 26-38, Tamai et al. disclose that the array controller generates a read or write request for data reconstruction. The generated read or write request has predetermined priority. When the disk array device provides relatively high priority, the read or write request is processed with priority, ensuring the end time of data reconstruction (allocating, among a plurality of resources in the storage array and a corresponding controller, more resource usage to the I/O requests for rebuilding than to the host I/O requests).

Referring to claim 9, in column 13, lines 46-48, Tamai et al. disclose that the array controller enqueues the generated read or write request to the queue in the corresponding recording medium according to the predetermined priority and in column 13, lines 26-38, Tamai et al. disclose that the array controller generates a read or write request for data reconstruction. The generated read or write request has predetermined priority. When the disk array device provides relatively high priority, the read or write request is processed with priority, ensuring the end time of data reconstruction (preempting a host I/O request in favor of a rebuild I/O request).

Referring to claims 10 and 14, in column 4, lines 57-60, Tamai et al. disclose that when another failure occurs in another disk drive of the same parity group while the defective disk drive is left as it is, reconstruction cannot be executed. Therefore,

reconstruction is required to be executed as early as possible. It is inherent to a RAID system how many failed disks in the storage array can be endured without permanently losing data varies based at least in part on a particular redundant array of independent disks (RAID) architecture level of the storage array.

Referring to claim 15:

a. In column 13, lines 26-38, Tamai et al. disclose that the array controller generates a read or write request for data reconstruction. The generated read or write request has predetermined priority. When the disk array device provides relatively high priority, the read or write request is processed with priority, ensuring the end time of data reconstruction (a priority identifier to determine whether host input/output (I/O) requests or rebuild I/O requests for a storage array are to have priority).

b. In column 13, lines 26-38, Tamai et al. disclose that the array controller generates a read or write request for data reconstruction. The generated read or write request has predetermined priority. When the disk array device provides relatively high priority, the read or write request is processed with priority, ensuring the end time of data reconstruction (and a request dispatcher, communicatively coupled to the priority identifier, to select host I/O requests and rebuild I/O requests for execution based at least in part on whether host I/O requests or rebuild I/O requests are to have priority).

c. In column 13, lines 43-48, Tamai et al. disclose that the array controller generates the read or write request required for data reconstruction with the

predetermined priority for each recording medium and the array controller enqueues the generated read or write request to the queue in the corresponding recording medium according to the predetermined priority (a request queue structure into which the rebuild I/O requests and the host I/O requests are placed to await selection for execution by the request dispatcher).

d. In column 13, lines 43-48, Tamai et al. disclose that the array controller generates the read or write request required for data reconstruction with the predetermined priority for each recording medium and the array controller enqueues the generated read or write request to the queue in the corresponding recording medium according to the predetermined priority (a queue controller, communicatively coupled to the request queue structure, configured to order requests in the queue structure so that host I/O requests are higher than rebuild requests only if host I/O requests are to have priority).

Referring to claim 21, in column 13, lines 26-38, Tamai et al. disclose that the array controller generates a read or write request for data reconstruction. The generated read or write request has predetermined priority. When the disk array device provides relatively high priority, the read or write request is processed with priority, ensuring the end time of data reconstruction (a plurality of resources and wherein the request dispatcher is to limit the host I/O request usage of at least one of the plurality of resources if rebuild I/O requests are to have priority).

Referring to claim 23, in column 13, lines 46-48, Tamai et al. disclose that the array controller enqueues the generated read or write request to the queue in the

corresponding recording medium according to the predetermined priority and in column 13, lines 26-38, Tamai et al. disclose that the array controller generates a read or write request for data reconstruction. The generated read or write request has predetermined priority. When the disk array device provides relatively high priority, the read or write request is processed with priority, ensuring the end time of data reconstruction (a request processor, communicatively coupled to the request dispatcher, to process I/O requests and preempt a host I/O request in favor of a rebuild I/O request).

4. Claims 15, 16, 20, and 23 are rejected under 35 U.S.C. 102(b) as being anticipated by Jones, U.S. Patent 5,680,539.

Referring to claim 15:

a. In column 4, lines 30-35, Jones discloses that during non-idle periods, a Host Queue Depth Monitor executing in conjunction with the Rebuild Task monitors the current host command queue depth generated by the host and increases or decreases a Desired Rebuild Queue Depth variable accordingly (a priority identifier to determine whether host input/output (I/O) requests or rebuild I/O requests for a storage array are to have priority).

b. In column 4, lines 43-49, Jones discloses that the Rebuild Task examines the Desired Rebuild Queue Depth variable and compares this variable with the actual rebuild queue depth. If the actual rebuild queue depth differs from the Desired Rebuild Queue Depth, the Rebuild Task submits additional rebuild requests until the rebuild queue depth equals or is a desired proportion of the Desired Rebuild Queue Depth (and a request dispatcher, communicatively

coupled to the priority identifier, to select host I/O requests and rebuild I/O requests for execution based at least in part on whether host I/O requests or rebuild I/O requests are to have priority).

c. In column 4, lines 27-31, Jones discloses a host command queue (a request queue structure into which the rebuild I/O requests and the host I/O requests are placed to await selection for execution by the request dispatcher).

d. In column 4, lines 30-35, Jones discloses that during non-idle periods, a Host Queue Depth Monitor executing in conjunction with the Rebuild Task monitors the current host command queue depth generated by the host and increases or decreases a Desired Rebuild Queue Depth variable accordingly. Further, in column 8, lines 39-43, Jones discloses that the rebuild requests are low priority so that, if a host request is submitted, the host request will have higher priority and will be immediately executed (a queue controller, communicatively coupled to the request queue structure, configured to order requests in the queue structure so that host I/O requests are higher than rebuild requests only if host I/O requests are to have priority).

Referring to claim 16, in column 6, lines 34-35, Jones discloses a disk array (wherein the storage array comprises a redundant array of independent disks (RAID) system).

Referring to claim 20, in column 9, lines 34-38, Jones discloses multi-level queues (wherein the request queue structure includes a plurality of queues).

Referring to claim 23, in column 7, lines 48-49, Jones discloses that the Rebuild Task dynamically compensates for the host command queue depth during the rebuild process (a request processor, communicatively coupled to the request dispatcher, to process I/O requests and preempt a host I/O request in favor of a rebuild I/O request).

Allowable Subject Matter

5. Claims 4 and 5 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

Response to Arguments

6. Applicant's arguments filed September 22, 2006 have been fully considered but they are not persuasive.

7. On page 9, under the section 35 U.S.C. §102, the Applicant argues, "thus, even though Jones mentions placing requests in the execution queue, there is no discussion or mention in ones of ordering requests in the execution queue so that host command requests are higher then rebuild requests." The Examiner respectfully disagrees. In column 8, lines 39-42, Jones discloses that the rebuild requests are low priority, so that, if a host request is submitted, the host request will have a higher priority and will be immediately executed."

8. Applicant's arguments, see pages 10-11, under the section 35 U.S.C. §102, filed September 22, 2006, with respect to claims 15 and 21 have been fully considered and

are persuasive. The rejection of claims 15 and 21 under 35 U.S.C. §102(b) as being anticipated by Thompson et al. has been withdrawn.

9. Applicant's arguments, see pages 12-17, under the section 35 U.S.C. §103, filed September 22, 2006, with respect to claims 1-14 and 22 have been fully considered and are persuasive. Therefore, the rejection has been withdrawn. However, upon further consideration, a new ground(s) of rejection is made in view of Tamai et al., U.S. Patent 6,799,283 B1.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Michael C. Maskulinski whose telephone number is (571) 272-3649. The examiner can normally be reached on Monday-Friday 9:30-6:00.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Robert W. Beausoliel can be reached on (571) 272-3645. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

Michael C Maskulinski
Examiner
Art Unit 2113